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The Old Industrial Area Economic Transformation and Sustainable Development: Optimization and Route Selection

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Abstract: The unreasonable industrial structure seriously restricts the present sustainable economic development of old industrial area. Based on the analysis of industrial structure status by SWOT, this article makes the Shang Jie district as a typical area of industrial structure's optimization and adjustment, builds the simulation model on choosing the optimizing route of industrial structure using System Dynamics. Combined with the theory of optimizing industrial structure, the thesis puts forward the route of optimizing industrial structure in ShangJie district, to point the way toward the supererogation and rationalization of industrial structure in old industrial area, as well as its upgrading of the industrial structure.

Key words: Industrial structure, system dynamic, simulation model, path selection

INTRODUCTION

With the rapid development of domestic economy, China's economic growth mode also has taken great changes: the economic development driving changes from the expansion of industry and industry number in the past to three industries jointly driving and structure optimization and upgrading drivien the change of direction now. Once prosperous and as a local economic foundation and the core area, the old industrial area has three obvious characteristics: Firstly, the strong industrial foundation and a galaxy of talents; secondly, the natural resources is rich, such as coal, but the singularity of product is more significant, the industrial structure is not reasonable; thirdly, environmental problems caused by the over-exploitation of resources is very prominent, the sustainable development ability is weak. Therefore, industrial structure optimization of the old industrial area is necessary to research in the opportunity of country vigorously promotes industrial transformation.

RESEARCH OF HOME AND ABROAD

In recent years, with the economics reference mathematical methods, game theory and method of operational research play an important role in the research of industrial structure. Igor (Sloot, 2003) proposed system dynamic model of the environment and industrial structure, the model includes the relationship between the regional economic and industrial enterprises, which provide the appropriate basis for decision making for managers; (Bahn et al., 2006) studied the relationship between economic growth and climate transform, gave the MERG model to simulate the real economy and used two-step method to coordinate the relationship between economic growth and climate change. Christodouloul (Christodoulou and Vlahos, 2000) thought a single enterprise is the industry's agent, studied the way of agents to enter and exit the industry, built a system model of a variable industry structure and took the telecommunications industry as an example to research, provided a new research ideas for the industrial evolutionary economics. Eric (Smith and Foley, 2008) studied general equilibrium state of economic from the dynamic perspective, to establish the linear balance equation and obtained the equilibrium optimal solution. (Korn et al., 1999) researched simulation model of manufacturing system, proposed the method of manufacturing research based on artificial intelligence, built simulation system of manufacturing using genetic algorithms, neural networks and fuzzy sets.

Domestic scholars mainly used foreign industrial structure optimization theory to study the industrial structure optimization and combined with the reality situation of our country. (Gao and Li, 2006), (Bai, 2009) and (Shen and Jiang, 2006) thought that we could optimize industrial structure through vigorously developing the tertiary industry, making the leading industry stronger, developing the high-tech industries, taking a new road to industrialization, enhancing independent innovation capability and so on. Hu (2011) thought that we should promote industrial structure optimization by giving full play to the function of the market mechanism, grasping the leading enterprises and industrial park construction,

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making use of sharing platform of technical resources and the drive of the key project. Jing, 2008 measured the level of industrial structure with the level factor of industrial structure in empirical study of long triangle.

Through the research status, the domestic and foreign scholars have done a great deal of useful exploration on the industrial structure optimization, providing a solid theoretical foundation for China's industrial structure optimization and the model of industrial structure optimization, but there still exist some problems: Research emphasizes on qualitative analysis, quantitative analysis and inspection with little and the industrial structure has the nature of randomness and uncertainty.

In the long evolution process, with the influence of natural resources, changes in demand and technological progress and the ecological environment and many other factors. System dynamics is an important kind of quantitative analysis tool to study regional industrial economy coordinated development system, which is used to study the feedback structure of the complex system, is good at dealing with nonlinear time-varying multiple feedback problem and more suitable for long-term, dynamic and strategic research. So this study uses system dynamics for quantitative analysis with the actual situation of ShangJie district industrial structure development and put forward the concrete realization path and development countermeasures of industrial structure optimization, providing scientific theoretical basis and technical support for ShangJie district's industrial structure optimization decision.

FORMULATION TO ROUTE OF INDUSTRIAL STRUCTURE OPTIMIZATION IN OLD INDUSTRIAL AREA

Most of the core industries of the old industrial area are heavy industry based resource consuming, with the general characteristics: a serious imbalance of industrial structure, serious environmental pollution, limited industrial development, highly value-added modern service industry development is slow and so on. But as a result of the geographical position, the core industry, economic status, resource reserves of each old industrial zone are not identical, analyzing current situation of old industrial area's industrial structure is difficult. So, the industrial structure of ShangJie district as empirical research object, this study analyzes the industrial structure of the old industrial area. Using the SWOT analysis method to study the present situation of industrial structure of the ShangJie district, it is summarized as shown in Fig. 1.

According to detailed analysis of the industrial structure's strengths, weaknesses, opportunities, threats in ShangJie district, with the industrial structure stochastic programming results oriented, based on industrial structure's present situation, it is formulatd the optional paths to realize industrial structure optimization in ShangJie district by vigorously developing ecological agriculture, transforming and promoting the traditional advantage industry, developing new industry, constructing livable city vocational education and comprehensive to speed up the development of modern service industry.

External environment	**Potential external threat (T)**	**Potential external opportunities (O)**
	1. Other city competition; 2. Industry body lack of growth; 3. Leading industry development space is limited ?	1. The rising economic zone is the national strategy; 2. Optimal allocation structure adjustment ; 3. The new material industry promoting economic growth; 4. Service industry development prospects ; 5. Scientific research strength?
Internal environment	**Potential internal advantage (S)**	**Potential internal weaknesses (W)**
	1. The geographical position is superior; 2. Energy resources rich enough; 3. The rich industrial foundation and features in aluminium industry; 4. Urban function relatively perfect?	1. Industrial structure is not reasonable ; 2. To improve the ability of independent innovation ; 3. The environmental protection question increasingly prominent; 4. Brand advocacy capacity relatively weak 5. Management mechanism remains to be perfect ; 6. Operation strategy relative shortage ?

Fig. 1: Analysis result of industry development's present situation in ShangJie district

SELECTION AND DEMONSTRATION TO ROUTE OF INDUSTRIAL STRUCTURE OPTIMIZATION IN THE OLD INDUSTRIAL AREA

Principle of system dynamics: The main theoretical basis of the system dynamics is the causal diagram of system, flow chart of system dynamics, System variables and system equations. The system is dynamic, complex and nonlinear, so it emphatically analysis system within the causality diagram and reasonable determines system variables in the modeling, which a helpful to improve the validity and rationality of final simulation results. Generally follow the following basic steps to solve the problem in the use of system dynamics (Sloot, 2003):

- Clear the purpose of modeling
- Determine the boundary of system
- Analysis the structure of system
- Establish a system dynamics model
- Simulate by the use of model

Construction of routing model

System dynamics model of routing: It is maked ShangJie district as demonstration for model construction and simulation analysis.

The purpose of modeling: The path selection model of industrial structure optimization in ShangJie district is constructed to further research the specific path of the upgrading of the ShangJie district's future industrial structure to achieve. Using system dynamics, model regards the investment of production factors as the main influence factor, analyzing the influence degree of different optimization path of GDP in a certain period of time, to provide a strong decision support for the final path selection of industrial structure optimization, so the main purpose of modeling is that researching the specific path of the ShangJie district's industrial structure optimization to achieve.

The assumptions of the model: When selecting the path of industrial structure in ShangJie district, the influential system factors are many, but it is impossible to put all the factors into model when constructing the it (Xu and Zou, 2006), so it's first to make the following assumptions about system dynamics model of ShangJie district's industrial structure before constructing.

Assumption 1: Assuming that ShangJie district is a closed industrial economic system and the internal industrial structure isn't influenced by other factors which

are outside ShangJie district. The GDP of ShangJie district is simplified:

$$G = f(X_1, X_2, X_3, X_4, X_5) \begin{cases} X_1 \geq 0 \\ X_2 \geq 0 \\ 0 \leq X_3 \leq 1, \text{ and} \sum X_3 = 1 \\ 0 \leq X_4 \leq 0.151 \\ 0 \leq X_5 \leq 1, \text{ and} \sum X_5 = 1 \end{cases}$$

Among them, G representatives the GDP of ShangJie district, X1 representatives fixed asset investment, X2 representatives fixed asset investment contribution of traditional industries new industry ecological agriculture modern service industry livable city vocational education, X3 representatives fixed asset investment proportion of traditional industries new industry ecological agriculture modern service industry livable city vocational education, X4 representatives expenditure proportion, X5 representatives each industry in a proportion of the GDP.

Assumption 2: In order to simplify the model, assuming that choosing a different path is achieved by the control of fixed assets investment proportion:

$$A = g(X_2, X_3) \begin{cases} X_2 \geq 0 \\ 0 \leq X_3 \leq 1, \text{ and} \sum X_3 = 1 \end{cases}$$

Among them, A representatives the GDP of implementing the five different paths, X2 representatives fixed asset investment contribution, X3 representatives investment proportion.

Assumption 3: The total output value of above-scale five pillar industries above-scale in second industry is the investigation target of traditional superior industry; the total output value of above-scale high-tech industry above-scale industry in second industry is the research object of new industry; the total output value of construction and real estate industry is the research object of building livable vocational education city; the total output value of the third industry is the research object of the modern service industry.

$$A = g(X_2, X_3) \begin{cases} X_2 \geq 0 \\ 0 \leq X_3 \leq 1, \text{ and} \sum X_3 = 1 \end{cases}$$

$$A = \varphi(G, X_5) \begin{cases} G \geq 0 \\ 0 \leq X_5 \leq 1, \text{ and} \sum X_5 = 1 \end{cases}$$

Among them, A representatives the GDP of implementing the five different paths, G representatives the GDP of ShangJie district, X5 representatives each industry in a proportion of the GDP.

The overall causal diagram of path selection: The implementation processes of five different paths are simpled for five subsystems and the five subsystems are subject to the different level influence of environment population and labor education and science and technology. Five subsystems have a direct contact with total output value of the first industry five pillar industries?high-tech industry construction service industry in ShangJie district. So, the complicated causality

exists between five subsystems and environment population and other auxiliary system. It is shown in Fig. 2.

The overall relationship flow of path selection: Based on the analysis of the GDP fixed assets investment financial expenditure education and science and technology, it can determine the variables of system and the relationship between the variables. The equation variable and symbols is shown in Table 1, the equations of education and science and technology, environment and other auxiliary system as follows:
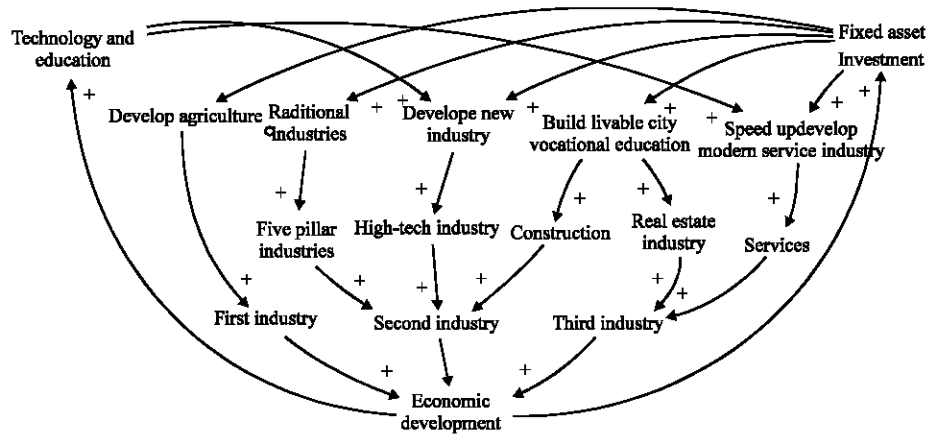
$$gzt = dsz*0.6291 \tag{1}$$

Fig. 2: Causal relationship of path selection

Table 1:Variable and symbols

| Variable	symbols	variable	symbols
Fixed total investment	gzt	Developing new industry	dxg
GDP	dsz	Education investment	jte
first industry production value	ysz	Fiscal spending	czc
third industry production value	ssz	Output value	nsz
second industry production value	esz	estate production value	fsz
Other retail industry proportion	qlb	therindustryproduction value	csc
Education investment proportion	jtb	Five industries output value	wsz
Develop service industry	jxf	construction	zsz
high-tech output value	gsz	traditional industry	gcg
Develope ecological agriculture	fsn	five industries'value	wcz
The added value	ncz	investment contribution	wtg
fixed assets investment	nte	five industries investment	wte
investment contribution	ntg	Five industries proportion	wtb
The proportion of investment	ntb	Build livable city	xyz
Contribution rate	gjg	construction output value	zcz
industry production value	gcz	fixed assets investmen	zte
The total investment in high-tech	gte	investment contribution	ztg
High-tech industry investment contribution	gtg	fixed assets proportion	ztb
High-tech fixed investment proportion	gtb	Real estate assets ratio	ftb
scientific and technological contribution	cjg	estate industry's add value	fcz
Other industry value added value	ccz	Real estate fixed total assets	fte
Other industry fixed assets investment	cte	investment contribution	ftg
Other industry investment contribution	ctg	fixed investment proportion	ftb
Other fixed assets ratio	ctb		
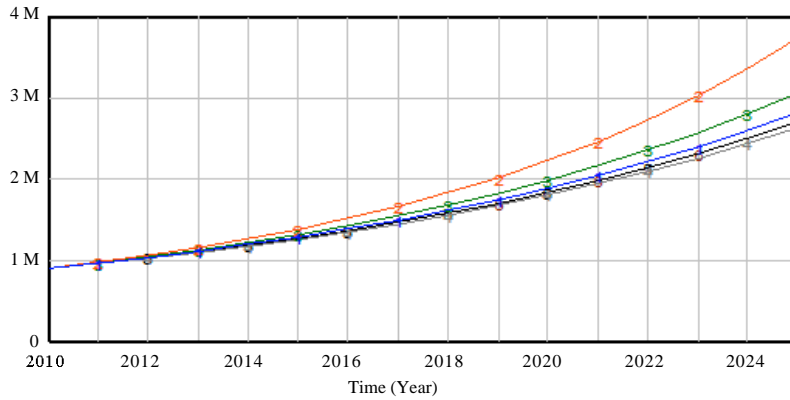
Fig. 3: The comparison chart of the 5 paths' GDP in ShangJie district

$$dsz = ysz + ssz + esz \qquad (2)$$

$$qlb = 0.2351 \qquad (3)$$

$$jtb = \text{IF THEN ELSE}(\text{MAX}(jxf, dxg) <= 1, \text{MAX}(jxf, dxg)*0.1933*(1+(\text{"<Time>"}-2010)*0.005), \text{MAX}(jxf, dxg)/2*0.1933*(1+(\text{"<Time>"}-2010)*0.005))$$
$$(4)$$

$$jte = jtb * czc \qquad (5)$$

$$ysz = nsz \qquad (6)$$
$$ssz = fsz + csc \qquad (7)$$

$$esz = (wsz + zsz + gsz)/(1-qlb) \qquad (8)$$

$$czc = \text{IF THEN ELSE}(\text{"<Time>"}<=2015, dsz*(0.076+(\text{"<Time>"}-2010)*0.015), dsz*0.151)$$
$$(9)$$

The main subsystem model in the system
Vigorously develop ecological agriculture system model: ShangJie district's agriculture is lagging behind, the level of development is low and the index of living environment is low, industrial pollution is relatively serious, the development of ecological agriculture can not only improve the region's GDP, but also can improve the living environment. The causal relationship of vigorously develop ecological agriculture is shown in Fig. 3.

After analysis, it is determined that output value of farming, forestry, husbandry and fishing is the level variable, the added-value of output value of farming, forestry, husbandry and fishing is the rate variable, fixed assets investment, fixed assets investment of farming, forestry, husbandry and fishing, proportion of investment in farming, forestry, husbandry and fishing, develop

ecological agriculture, investment contribution of farming, forestry, husbandry and fishing is the auxiliary variable or constant. The equations of developing ecological agriculture relationship are:

$$fsn = 1 \qquad (10)$$

$$nsz = \text{INTEG}(ncz, 5361) \qquad (11)$$

$$ncz = nte * ntg * 0.06 \qquad (12)$$

$$nte = ntb * gzt \qquad (13)$$

$$ntb = fsn * 0.004 \qquad (14)$$

$$ntg = 0.36 \qquad (15)$$

Transform and promote the traditional superior industry system model: Transform and promote the traditional superior industry is mainly to update the outdated equipment and production line of that, which is to achieve through the fixed assets investment.

Through the analysis, it is determined that output value of five pillar industries is the level variable, the added-value of output value of five pillar industries is the rate variable, five pillar industries investment, investment contribution of five pillar industries, fixed assets investment, proportion of investment in five pillar industries, transform and promote the traditional superior industry, Time is the auxiliary variable or constant. The equations of transforming and promoting traditional advantage industrial relationship are:

$$gcg = 1 \qquad (16)$$

$$wsz = \text{INTEG}(wcz, 464674) \qquad (17)$$

$$wcz = 0.0488* wtg* wte \qquad (18)$$

$$wtb = IF\ THEN\ ELSE("<Time>"<=2020,\ gcg\ *0.3*(1-\\("<Time>"-2010)*0.0005)\ ,0.1\,) \qquad (19)$$

$$wtg = 0.27 \qquad (20)$$

$$wte = wtb* gzt \qquad (21)$$

Vigorously develop new industry system model:
Vigorously develop new industry also is a concrete way to achieve the industrial structure optimization of ShangJie district. Because the new industry has just started to develop and the infrastructures are not perfect, it is mainly through science and technology innovation and investment in fixed assets to achieve the target that vigorously develop new industry in ShangJie district.

Through the analysis, it is determined that output value of high-tech industry is the level variable, the added-value of output value of high-tech industry is the rate variable, the second industry production value, Gross National Product, fiscal expenditure, education and science investment, proportion of investment in education and science, vigorously develop new industry, investment proportion of fixed asset in high-tech industry, Time, investment of high-tech industry, fixed assets investment, investment contribution of high-tech industry, the contribution of education and science in high-tech industry is the auxiliary variable or constant. The equations of developing new industrial relationship are:

$$dxg = 1 \qquad (22)$$

$$gjg = 0.019 \qquad (23)$$

$$gcz = (jte* gjg+gte* gtg)*0.05 \qquad (24)$$

$$gtb = dxg\ *0.009*(1+("<Time>"-2010)*0.0005)\ (25)$$

$$gsz = INTEG(gcz, 6668) \qquad (26)$$

$$gte = gzt* gtb \qquad (27)$$

$$gtg = 8.52 \qquad (28)$$

Actively complete livable vocational education city system model: In order to improve consumption level and increase the number of permanent population, actively complete livable vocational education city is a more rapid and effective way. At present, professional education is in the initial stage in the ShangJie district, complete livable

vocational education city is mainly through the development of construction and real estate industry in district to drive economic.

Through the analysis, it is determined that production value of construction and production value of real estate industry is the level variable, the added-value of production value of construction and added-value of production value of real estate industry is the rate variable, investment contribution of construction, investment of fixed asset in construction, investment proportion of fixed asset in construction, complete livable vocational education city, investment proportion of fixed asset in real estate industry, investment of fixed asset in real estate industry, investment contribution of real estate industry is the auxiliary variable or constant. The equations of building livable city vocational education relationship are:

$$xyz = 1 \qquad (29)$$

$$zsz = INTEG(zcz,71419) \qquad (30)$$

$$zcz = zte* ztg*1.1 \qquad (31)$$

$$ztb = xyz*1e-006 \qquad (32)$$

$$zte = gzt* ztb \qquad (33)$$

$$ztg = 79.8 \qquad (34)$$

$$ftb = xyz*0.241 \qquad (35)$$

$$fsz = INTEG(fcz, 25338) \qquad (36)$$

$$fcz = (fte*ftg)*0.27 \qquad (37)$$

$$fte = gzt*ftb \qquad (38)$$

$$ftg = 0.241 \qquad (39)$$

Develop modern service industry system model: The service facilities and organizations of ShangJie district are in the primary stage and the level of service is low, which is not matched to high-level industrial structure, so develop modern service industry also is a concrete way to achieve the industrial structure optimization of ShangJie district, which is mainly achieved through increasing the investment in science and education and fixed assets.

Through the analysis, it is determined that production value of services in addition to real estate industry is the level variable, the added-value of production value of services in addition to real estate

industry is the rate variable, scientific and technological contribution in services, speed up the development of modern service industry, investment proportion of fixed asset in services in addition to real estate industry, investment of fixed asset in services in addition to real estate industry, investment contribution of services in addition to real estate industry is the auxiliary variable or constant. The equations of developing modern service industry relationship are:

$$jxf = 1 \tag{40}$$

$$cjg = 2.7188 \tag{41}$$

$$ccz = jte^* \ cjg + cte^* ctg \tag{42}$$

$$ctb = jxf^*0.2059^*(1+(\text{"<Time>"}-2010)^*0.05) \tag{43}$$

$$cte = gzt^*ctb \tag{44}$$

$$ctg = 0.141 \tag{45}$$

$$csc = INTEG(ccz, 154342) \tag{46}$$

Model simulation

Model test: It is needed to test the effectiveness of model after construction and before simulation. The test of effectiveness is mainly divided into consistency test and structural test of model. The consistency test of model runs through unit test of Vensim software, after repeating check model can be operated in the situation that the final test result shows that the unit is not inconsistent (Liu *et al.*, 2004). Structural testing of the model is to forecast the ShangJie district's GDP in 15 years under maintaining the developmental status of the original industrial investment, then compare the predicted values and the predicted values of GDP, fiscal spending, fixed assets investment in 2010 and 2011. As shown in Table 2, prediction error in the plus or minus 7% or so and within acceptable limits. So the path selection diagram of ShangJie district's industrial structure optimization is reasonable and effective in this study. The routing system could be simulated and the execution results of routing could be reasonably predicted, to provide a theoretical basis for path selection.

The scheme of model simulation: This study makes the decision analysis through the change of the investment proportion of fixed asset and education and science and technology. The specific scheme is as follows:

The simulation scheme 1: Keeping the total social investment in fixed and only changing the investment proportion of new industrial fixed assets and education and science and technology to make the investment to title the new industrial.

The simulation scheme 2: Under the situation of keeping the proportion of total social investment and fiscal expenditure the same, to increase the investment proportion of services' fixed assets which is excluding real estate industry and spending proportion of education and science and technology.

The simulation scheme 3: Under the situation of keeping the proportion of total social investment the same, to increase the total investment proportion of construction and real estate industry's fixed assets.

The simulation scheme 4: Under the situation of keeping the proportion of total social investment the same, to increase the investment of the traditional industrial fixed assets.

The simulation scheme 5: Under the situation of keeping the total investment proportion of social fixed assets the same, to increase the investment proportion of the first industry's fixed assets, namely farming, forestry, husbandry and fishing.

The above plan each path of the proportion of investment in fixed assets worth to realize by adjusting the development of ecological agriculture, transform and promote the traditional advantage industry, developing new industry, developing new industry, build livable city vocational education, speeding up the development of modern service industry of initial, the results of adjustment is shown in Table 3.

The results of model simulation: Through the model simulation with the above program by Vensim software, the simulation results is shown in Fig. 3. Line 1 represents

Table 2: Table of predictive value and the actual value error analysis unit: A hundred million

Index	GDP	Fiscal spending	Fixed asset investment
The actual value of 2010	89	6.98	58.4
The predicted value of 2010	89.46	6.8	56.28
Prediction error (%)	0.5	-2.28	-3.63
The actual value of 2011	99.2	8.86	65
The predicted value of 2011	96.13	8.75	60.48
Prediction error (%)	-3.06	-1.24	-6.95

Table 3: Route choice of ShangJie industrial structure optimization model parameter adjustment table

	Eco-Agriculture	Tra-industry	New industry	V and E city	Service industry
Eco-agriculture	2	1	1	1	1
Tra-industry	1	1.2	1	0.75	1
new industry	1	1	2	1	1
V&E city	1	0.6	1	2	1
Service-industry	1	0.6	1	1	2

Table 4: The summary table of GDP in ShangJie district under 5 paths Unit: Ten thousand

year	2010	2011	2012	2013
new industry	894625	959499	1.03E+06	1.11E+06
modern service education city	894625	971854	1.06E+06	1.15E+06
traditional industry	894625	964406	1.04E+06	1.12E+06
eco agriculture	894625	955037	1.02E+06	1.09E+06
keep the same	894625	956727	1.02E+06	1.10E+06
	894625	956678	1.02E+06	1.10E+06
year	2014	2015	2016	2017
new industry	1.19E+06	1.28E+06	1.38E+06	1.49E+06
modern service education city	1.26E+06	1.38E+06	1.51E+06	1.66E+06
traditional industry	1.22E+06	1.32E+06	1.43E+06	1.55E+06
eco agriculture	1.17E+06	1.25E+06	1.34E+06	1.44E+06
keep the same	1.18E+06	1.26E+06	1.36E+06	1.46E+06
	1.18E+06	1.26E+06	1.36E+06	1.46E+06
year	2018	2019	2020	2021
new industry	1.61E+06	1.74E+06	1.89E+06	2.04E+06
modern service education city	1.83E+06	2.01E+06	2.22E+06	2.46E+06
traditional industry eco agriculture	1.68E+06	1.82E+06	1.98E+06	2.16E+06
keep the same	1.55E+06	1.67E+06	1.80E+06	1.94E+06
	1.57E+06	1.70E+06	1.83E+06	1.98E+06
	1.57E+06	1.70E+06	1.83E+06	1.98E+06
year	2022	2023	2024	2025
new industry	2.21E+06	2.40E+06	2.60E+06	2.82E+06
modern service education city	2.72E+06	3.02E+06	3.36E+06	3.74E+06
traditional industry	2.35E+06	2.56E+06	2.80E+06	3.06E+06
eco agriculture	2.09E+06	2.25E+06	2.43E+06	2.62E+06
keep the same	2.14E+06	2.31E+06	2.50E+06	2.70E+06
	2.13E+06	2.31E+06	2.49E+06	2.70E+06

vigorously developing new industry, line 2 represents the development of modern service industry, line 3 represents construction of a vocational education city, line 4 represents transforming and promoting the traditional advantage industry, line 5 represents vigorously developing ecological agriculture, line 5 represents the current GDP, the unit is ten thousand yuan.

Table 4 is the summary that GDP in ShangJie district under 5 different realization paths. The influence of vigorously develop new industry, the development of modern service industry, construction of a vocational education city, transform and promote the traditional advantage industry and vigorously develop ecological agriculture on the GDP of ShangJie district can be clearly seen from the table.

Results analysis

Gross regional product analysis: Compare five different path prediction simulation respectively with simulation predicted value that keep on about choosing the transform and promoting the traditional advantage industry, developing new industry, actively in Zhengzhou livable city vocational education, comprehensive to speed up the development of modern service industry and to develop ecological agriculture. The results are seen in Table 5. The difference value are positive comparing developing new industry, actively establish Zhengzhou livable city vocational education, comprehensive to speed up the development of modern service industry and to develop ecological agriculture the four path with maintain the status quo. It is shown that the four paths make ShangJie area GDP larger than to maintain the existing industrial structure and the proportion of investment in GDP (Gong *et al.*, 2011). The predicted value difference value is negative about transforming and promoting the traditional advantage industry to maintain the status quo. It is suggests that in future development tendency, the development of traditional superior industry can't ShangJie to bring more economic benefits.

Making contrast diagram choose five different paths and to maintain the status quo in the Gross Domestic Product (GDP) the difference between the predicted value. As shown in Fig. 4 shows, the development of modern service industry for ShangJie bring economic

Table 5: Predicted value difference value table about choosing five different paths and to maintain the status quo in the gross domestic product (GDP) Unit: Ten thousand

| Year 2010	2011	2012	2013	
new industry	0	2821	6.04E+03	9730
modern service	0	15176	33610	55900
education city	0	7728	16600	26780
traditional industry	0	-1641	-3510	-5630
eco agriculture	0	49	100	170
Year 2.01E+03	2.02E+03	2.02E+03	2.02E+03	
new industry	1.39E+04	1.87E+04	24170	30380
modern service	82690	114750	153010	198550
education city	38440	51770	67000	84410
traditional industry	-8040	-10780	-13900	-17420
eco agriculture	240	320	410	510
Year 2018	2019	2020	2021	
new industry	37440	45470	54590	64940
modern service	252610	316670	392450	481970
education city	104260	126910	152720	182110
traditional industry	-21410	-25920	-31040	-36840
eco agriculture	630	780	930	1100
Year 2022	2023	2024	2025	
new industry	76560	89720	104620	121500
modern service	589760	716700	866070	1041780
education city	218000	258870	305410	358400
traditional industry	-44580	-53350	-63290	-74540
eco agriculture	1300	1520	1760	2050
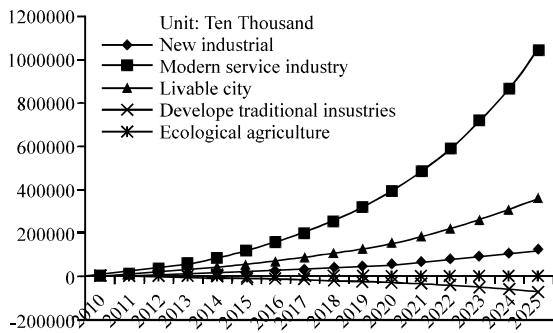
Fig. 4: Predicted value difference contrast diagram between choose five different paths and maintain the status quo in the Gross Domestic Product (GDP)

earnings growth is most rapidly, which in turn is to establish a livable city vocational education, the development of new industries and the development of ecological agriculture and finally to upgrade traditional industries.

Rationalization of industrial structure optimization and highly criterion: The industrial structure optimization is mainly from the rationalization and highly successful the decision and ShangJie industrial structure optimization path selection process, through compare the five different paths of rationalization and highly value judgment and to maintain the status of numerical, research through the five different paths to realize the industrial structure optimization is to achieve the optimization goals and

Table 6: 2025 predicted value of the tertiary industry scale

	The first industry	The second industry	The third industry
new industry	0.24	32.62	67.14
modern service	1.80E-01	22.53	77.29
education city	0.22	27.22	72.56
traditional industry	0.25	32.33	67.42
eco agriculture	0.29	31.15	6.86E+01
keep the same	0.25	31.18	6.86E+01

objectives. After 2010-2025 15 years of industrial structure adjustment, the optimization results will show at the beginning of the effect, therefore, using the 2025 years of the prediction data of the rationalization of industrial structure optimization and highly for decision.

Reasonable decision: According to the system dynamics simulation and the forecast of 2025 in the first, second and third industry's GDP and population calculate the proportion of the tertiary industry. As shown in Table 6.

Through analysing the five different paths of the proportion of tertiary industry, the industrial structure rationalization from high to low in turn is to develop modern service industry, build livable city vocational education, the development of new industry, transform and promote the traditional industry and the development of ecological agriculture.

Highly decision: Make highly decision by using hamming distance method. It is divided into agriculture, five pillar industries, high-tech industry, construction industry and the real estate services outside the five industries, including c take 1, calculate between the five different paths under implementation respectively and keep on the hamming distance (Wang, 2011). As shown in Table 7.

Table 7: Hamming distance table

Industry	New industry	Service industry	V and E city	traditional industry	Eco agriculture
R_{AB}	0.9587	0.8311	0.9347	0.9826	0.9991

The bigger of the Hamming distance, the closer about keeping the original investment proportion state. Through the comparative analysis of the results of the hamming distance, found that the development of ecological agriculture and to maintain the status quo is closest and the development of modern service industry and to maintain the status quo is farthest. Therefore, five different paths after the implementation of the industrial structure highly from high to low in turn is to develop modern service industry, build livable city vocational education, the development of new industry, transform and promote the traditional industry and the development of ecological agriculture.

The industrial structure optimization path: It is shown that vigorously develop modern service industry is ShangJie industrial structure optimization the way through the above study. In the short term, contribution is similar either the development of new industry or build livable city vocational education to ShangJie area GDP.But as time goes on, contribution on the regional GDP will be more and more bigger if build livable city vocational education. So building livable city vocational education is based on ShangJie long-term benefits and providing powerful support for the long-term development of ShangJie. The new industry in the initial period of time to ShangJie area GDP influence is bigger, but as ShangJie industrial structure is reasonable and perfect, industry to GDP influence gradually narrowed. Ecological agriculture in economic growth have certain effect, but ShangJie is a high degree of industrialization and agriculture just a small part of the industry chain and it less effect to the general economic indicators ShangJie in the future and cannot form the core of the ShangJie competitive industry. ShangJie traditional advantage industry in a certain period of ShangJie area is still an important part of GDP, but with the rapid development of global economy and science and technology innovation, resource intensive and labor intensive industry will become the advantages of traditional ShangJie restricted economic development bottleneck. Therefore, ShangJie industrial structure optimization should choose to the development of modern service industry and build livable city vocational education as the main said, improve transform traditional advantage industry and new industry as the foundation, develop ecological agriculture supplemented by path.

CONCLUSION

This study analyses the old industrial area industrial structure by using SWOT and empirical research the ShangJie as an example. Using system dynamics model to implement dynamic evolution path is simulate and choosing the the most favorable path for old industrial area industrial structure optimization. This study overcomes the traditional research focuses on the qualitative analysis, quantitative analysis and inspection with little, lack of empirical support for the shortage of the old industrial area. And at the same time, providing scientific theoretical basis and technical support industrial structure optimization decision for old industrial area.

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